

UNIT ANALYSIS HANDOUT

Unit analysis is a method used to convert from one unit of measure to another. In a unit analysis problem, we place measurements into fraction form, build a product of fractions, and eliminate unwanted units. The steps for performing a unit analysis are as follows:

1. Determine what conversion facts are needed
2. Write the starting fact with units included as a fraction
3. Write the ending fact with units included as a fraction
4. Between the starting and ending, build a product of fractions using the necessary conversion facts. Arrange the fractions so that the units to be eliminated can be cancelled
5. Cancel unwanted units
6. Perform the numerical calculations

Look at the following examples. Note how the canceling is done.

EX. 1: Change 45 months to years

Conversion fact needed: one year = 12 months

$$\frac{45 \cancel{\text{months}}}{1} \cdot \frac{1 \text{ year}}{12 \cancel{\text{months}}} = \frac{45}{12} = 3.75 \text{ years or } 3\frac{3}{4} \text{ years}$$

EX. 2: Change 25 yards to feet

Conversion fact needed: 3 feet = 1 yard

$$\frac{25 \cancel{\text{yards}}}{1} \cdot \frac{3 \text{ feet}}{1 \cancel{\text{yard}}} = \frac{75 \text{ feet}}{1} = 75 \text{ feet}$$

EX. 3: Change 4 meters to yards

Conversion facts needed: 36 inches = 1 yard

39.37 inches = 1 meter

$$\frac{4 \cancel{\text{meters}}}{1} \cdot \frac{39.37 \cancel{\text{inches}}}{1 \cancel{\text{meter}}} \cdot \frac{1 \text{ yard}}{36 \cancel{\text{inches}}} = \frac{157.48 \text{ yard}}{36} = 4.37 \text{ yards}$$

EX. 4: Change 88 feet per second to miles per hour

Conversion facts needed: 5280 feet = 1 mile

60 minutes = 1 hour

60 seconds = 1 minute

$$\frac{88 \cancel{\text{feet}}}{1 \cancel{\text{second}}} \cdot \frac{1 \text{ mile}}{5280 \cancel{\text{feet}}} \cdot \frac{60 \cancel{\text{seconds}}}{1 \cancel{\text{minute}}} \cdot \frac{60 \cancel{\text{minute}}}{1 \text{ hour}} = \frac{(88)(60)(60) \text{ miles}}{5280 \text{ hour}} = \frac{316800 \text{ miles}}{5280 \text{ hour}} = 60 \frac{\text{mi}}{\text{hr}}$$

Use unit analysis to convert the following units of measure. Round decimal answers to the nearest hundredths.

1. Change 6 miles to feet 1. _____
2. Change 33 feet to yards 2. _____
3. Change 66 inches to feet 3. _____
4. Change 5 meters to inches (hint: 1 meter = 39.37 inches) 4. _____
5. Change 15 feet to meters 5. _____
6. Change 64 hours to minutes 6. _____
7. Change 56 hours to seconds 7. _____
8. Change 1,314,000 minutes to years 8. _____
9. Change 1000 liters to quarts (hint: 1 liter = 1.0567 quarts) 9. _____
10. Change 3 liters to gallons (hint: 1 gallon = 4 quarts) 10. _____

Use unit analysis to convert the following rates. Round decimal answers to the nearest hundredths. Assume 40-hour workweek and 52-week year

11. Change \$35,000 per year to dollars per hour 11. _____
12. Change \$8.25 per hour to dollars per year 12. _____
13. Change 220 feet per second to miles per hour 13. _____
14. Change 44 miles per hour to feet per second 14. _____

15. Suppose you plan to visit Carlsbad Caverns. You want to take the three-mile walking tour. At home, you pace your self and find out that you stroll 90 feet per minute. Use unit analysis to determine how many hours it will take you to walk the 3 miles.

Hint: 1 mile = 5280 feet

15. _____

16. Kevin recently accepted a job at a Lucky Seven store 17 miles from his house. Use the following information and unit analysis to answer questions a, b, and c. Round answers to the nearest hundredth.

Salary: \$8.75 per hour

40-hour workweek

52-workweeks per year

5 days of work per week

Gas mileage: 21 miles per gallon

Gas costs: \$1.26 per gallon

Average speed: 45 miles per hour

Daily round trip to work and back home: 34 miles

a. What is Kevin's annual salary? 16a. _____

b. How much will Kevin spend on fuel each week? 16b. _____

c. How many hours will Kevin spend commuting each week? 16c. _____

Answer Key

1. 31,680 feet
2. 11 yards
3. 5.5 feet
4. 196.85 inches
5. 4.57 meters
6. 3,840 minutes
7. 201,600 seconds
8. 2.5 years
9. 1,056.7 quarts
10. .79 gallons
11. \$16.83 per hour
12. \$17,160 per year
13. 150 miles per hour
14. 64.53 feet per second
15. 2.94 hours
- 16a. \$18,200 per year
- 16b. \$10.20
- 16c. 3.78 hours